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TRANSLATING MULTIPLE ASSESSMENT TECHNIQUES INTO AN INTERVENTION SELECTION MODEL FOR CLASSROOMS

MICHAEL M. MUELLER, RON P. EDWARDS, AND DANA TRAHANT

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Translating current research to school-based clinical practice highlights issues not often encountered in laboratory settings. With the assistance of a consultant, teachers conducted functional analyses, brief multielement treatment comparisons, and controlled treatment evaluations under naturalistic conditions in the classroom. Teachers also provided input on treatment selection. Treatment integrity data collected throughout the study suggested that teachers implemented analyses and treatments with high integrity. The functional analysis outcomes combined with effectiveness and acceptability data led to the selection of interventions that reduced problem behavior in the classrooms for each of 3 children.

DESCRIPTORS: classroom settings, functional analysis, intervention selection, negative reinforcement, positive reinforcement, translational research, treatment integrity

State-of-the-art methods for assessing problem behavior and evaluating potential treatments should be incorporated into classrooms as part of routine service provision. To do so effectively, teachers must participate in these activities. An increasing number of studies have demonstrated the use of these techniques (e.g., functional analyses, brief treatment evaluations) in naturalistic settings such as schools (e.g., Ervin, DuPaul, Kern, & Friman, 1998; Moore et al., 2002; Mueller, Sterling-Turner, & Scattone, 2001; Northup et al., 1994). However, the field would benefit from additional demonstrations.

An advantage of functional analysis is that it expands the array of treatment options that are likely to be effective in the classroom. For example, numerous treatments have been developed for problem behavior reinforced by escape from academic tasks. Escape extinction has often been combined with some type of reinforcement procedure (e.g., differential reinforcement of alternative behavior [DRA], noncontingent reinforcement [NCR]). Delivering either the functional reinforcer (i.e., escape) or potent positive reinforcers for compliance has been shown to be effective even when extinction has not been used (e.g., DeLeon, Neidert, Anders, & Rodriguez-Catter, 2001; Lalli et al., 1999; Piazza et al., 1997; Roane, Fisher, & Sgro, 2001).

In school settings, several factors influence the use of specific behavioral interventions. Treatment procedures that are acceptable to teachers, relatively easy to implement, and minimize disruption in ongoing classroom instruction may be preferable. For example, interventions that involve the delivery of conditioned positive reinforcers such as tokens may be less disruptive to ongoing classroom activities than interventions that require teachers to deliver immediate breaks, tangible items, or activities (Alberto & Troutman, 1995; Kazdin & Bootzin, 1972). Furthermore, interventions for classrooms should be easy to implement so a teacher can

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Address correspondence to Michael M. Mueller, May South, 1770 The Exchange, Suite 140, Atlanta, Georgia 30339 (e-mail: mmueller@mayinstitute.org).

use the procedures while simultaneously addressing the needs of other students in the same classroom. For example, NCR does not require continuous monitoring of behavior and thus may be easier to implement than differential reinforcement. Because the teacher ultimately will decide whether or not to use a specific procedure, a reasonable approach may be to have teachers conduct functional analyses, brief treatment comparisons, and controlled treatment evaluations in the classroom. In addition, teacher input should be solicited about the potential treatments. The purpose of the current study was to demonstrate this methodology for classroom problem behaviors that were maintained by negative reinforcement.

Interventions selected for evaluation (NCR, DRA, and differential negative reinforcement of alternative behavior [DNRA]) represented a range of possible treatment options that a school psychologist might recommend based on the results of a functional analysis. Positive-reinforcement-based NCR and DRA procedures using tokens as reinforcers were chosen for several reasons. First, previous research has suggested that positive reinforcement strategies are acceptable to teachers (Gresham, 1989; Lentz, Allen, & Erhardt, 1996; Witt, Martens, & Elliott, 1984). Second, the delivery of conditioned positive reinforcers may be less disruptive to ongoing classroom activities than the delivery of functional reinforcers (e.g., escape). Third, it seemed important to evaluate both contingent and noncontingent delivery of reinforcers because relative efficacy may be idiosyncratic across students, and teachers may prefer one over the other. Finally, previous research has suggested that reinforcing compliance can decrease negatively reinforced problem behavior (DeLeon et al., 2001; Lalli et al., 1999; Piazza et al., 1997). However, DNRA also was included because the functional reinforcer (i.e., escape) may be more potent than positive reinforcers and because some teachers may prefer to use breaks from work as reinforcers for appropriate behavior instead of tangible or classroom activity reinforcers.

METHOD

Participants and Setting

Participants were 3 children enrolled in first-grade classrooms. Inclusion in the study occurred after a functional analysis indicated that a participant's problem behavior was maintained by negative reinforcement. This inclusion criterion was used so that the same treatments could be evaluated across participants and because problem behavior exhibited by individuals with disabilities is commonly maintained by escape (Ervin et al., 2001; Iwata et al., 1994).

Nelly, a 7-year-old girl who had been referred for the assessment and treatment of tantrums, was enrolled in a self-contained special education class for children with developmental delays or speech and language deficits. Nelly had been diagnosed as developmentally delayed at the age of 5 years due to several learning and language deficits. Her receptive language skills were within normal levels, and she spoke in full sentences. Nelly took three antiseizure medications throughout the study: Depokote (250 mg in the morning, 375 mg at noon, 250 mg in the evening), Topamax (50 mg in the morning, at noon, and in the evening), and Dylantin (50 mg in the morning and 75 mg in the evening). Nelly's classroom contained five other students, a teacher, and a teacher's assistant. Nico, a 7-year-old boy who had been referred for the assessment and treatment of inappropriate vocalizations, was enrolled in a general education class. He had no medical or mental diagnoses and functioned within the normal range of hearing, vision, language, and academics. Nico's classroom contained 20 other students, a teacher, and a teacher's assistant. Max, a 7-year-old boy,

had been diagnosed with severe to profound hearing impairment and was enrolled in a classroom for students with hearing impairments. He had been referred for the assessment and treatment of head shaking. Max wore hearing aids in each ear and a frequency modulator (FM) trainer to block out background noise. The combination of the hearing aids and FM trainer brought Max's hearing to the 25- to 30-dB range, allowing him to hear at the level of typical speech. Max's classroom contained one teacher and one peer.

The participants' teachers served as therapists throughout the study. All sessions were conducted during typically scheduled ongoing classroom activities at the time identified during the initial referral as the most problematic time for each problem behavior. Academic instruction continued for all other students in a typical manner (or with only slight deviations).

Response Measurement and Reliability

Nelly's problem behavior was tantrums, defined as whining (high-pitched nonword vocalization), crying (tears coming out of eyes), hitting objects (forceful contact between inanimate objects and the hand or foot), and aggression (physical contact with teacher or peer with a punching, slapping, or pinching motion; or making contact between foot and teacher or peer by way of a forward swinging motion of her leg). Nico's problem behavior consisted of inappropriate vocalizations, defined as all verbalizations or vocalizations that were not task related (e.g., noises, whining, complaining, crying). Problem behavior for Max was head shaking, defined as orienting his head towards the ceiling and moving it from side to side. The alternative behavior for all participants during DNRA and DRA sessions was task engagement, defined as directing eyes towards the work activity, responding appropriately to the task, or manipulating task materials in the absence of the target problem behavior.

For all sessions, trained graduate students recorded the occurrence of participants' problem behavior via paper and pencil using continuous 10-s partial-interval recording. The first author trained primary and reliability observers to an interobserver agreement estimate of at least 80%. Estimates were calculated by dividing agreements by agreements plus disagreements and multiplying by 100%. Agreements were defined as identically marked intervals, and disagreements were defined as intervals that contained different recordings between observers. Agreement observations were conducted during 30%, 38%, and 26% of the functional analysis, treatment analysis, and treatment evaluation sessions for Nelly, Nico, and Max, respectively. Mean agreements for problem behavior were 96% (range, 87% to 100%) for Nelly, 97% (range, 92% to 100%) for Nico, and 98% (range, 97% to 100%) for Max.

Procedural integrity was assessed during all functional analysis, treatment analysis, and treatment evaluation sessions. Observers recorded teacher behavior within each session on the same recording forms used to record participant behavior. Procedural integrity estimates were derived from examining the recording forms and calculating the percentage of correctly implemented procedural steps for each session. For example, teacher behaviors included delivering tokens, removing task materials, and delivering attention (more detailed information can be obtained from the authors). Mean procedural integrity estimates for each participant throughout each phase were at least 90% (range, 90% to 100%).

Procedure

The lead teacher in each classroom conducted all procedures. All necessary teacher training was conducted during the teacher's

planning period or via written instruction delivered to the teacher during the day. Specifically, written protocols were given to the teachers to read. Follow-up question-and-answer sessions were conducted, as were direct training sessions that involved an author role-playing the part of the child so performance feedback could be delivered.

Functional analyses were conducted to confirm the results of an indirect assessment (Functional Assessment Informant Record for Teachers; Doggett, Mueller, & Moore, 2002; Edwards, 2002). Participants then were exposed to a brief treatment comparison to identify a potentially effective treatment, which was tested in a more extended evaluation.

Pretreatment Assessments

Functional analysis. The functional analysis included a series of conditions similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) and Northup et al. (1991). The assessment included teacher attention, escape from task demands, and control conditions presented in a multielement design. All sessions lasted 10 min. One session of each condition was presented daily in random order. Each participant was given a 5-min break between conditions. The specific procedures for each participant differed slightly because the materials and prompting strategies used in the participants' classrooms were incorporated into the analyses.

During the escape condition, Nelly was seated at a small work table beside the teacher and two peers. The teacher presented a word-matching task that previously had been associated with high levels of tantrums. A three-prompt procedure was used. The first prompt was a verbal task demand. If no response was initiated within 5 s, a verbal and gestural prompt was used. If no response was initiated within 5 s, the teacher physically guided Nelly's hand as the verbal demand was again repeated. If Nelly responded correctly during either of the first two prompts, verbal or physical attention was delivered. The next trial began approximately 5 s after the last trial ended. The teacher removed the task from the table and turned away for 20 s contingent on tantrums. After 20 s had elapsed, the teacher re-presented the task.

Nico and Max were seated at an individual desk or work table during the escape condition. The tasks presented to Nico and Max were writing worksheets that had been previously associated with high levels of the target problem behavior. The condition began with an initial presentation of the worksheets and a verbal request (all requests were spoken and signed for Max due to his hearing impairment) to begin working. At 30-s intervals, the teacher delivered a verbal instruction to get to work. Contingent on the target problem behavior, the teacher removed the work and turned away for 20 s. At the end of the 20 s, the teacher re-presented the work and reinitiated the delivery of task demands every 30 s. All other behavior was ignored.

The attention and control conditions were similar for all participants. In the attention condition, the participant was seated in the same desk or table used in the escape condition. The materials used in the attention condition were either academic materials not previously associated with high levels of problem behavior or leisure activities such as a puzzle or a book. The teacher ignored all behaviors except target problem behaviors for which she reprimanded with a brief verbal statement such as "Stop doing that, I've asked you not to do that." In the control condition, participants were given access to preferred activities. All target problem behaviors were ignored. Noncontingent attention was available from the teacher but was not programmed for systematic delivery.

Stimulus preference assessment. A preference

assessment was conducted to identify back-up positive reinforcers for use in a token program as part of treatment with NCR and DRA. Each teacher and participant nominated five items each. Those items (up to 10) were made available in free-operant and paired-choice conditions that identified five items per student for which tokens could be exchanged (Fisher et al., 1992). Each item was made available in a free-operant assessment. The paired-stimulus assessment was used if the assessment did not reveal a clear hierarchy of preferences. Identified items and activities included computer use, books, blocks, and coloring on a dry-erase board.

Establishing tokens as conditioned reinforcers. After informal verbal instructions were given explaining that tokens could be exchanged for the preferred items, practice exchanges that led directly to the identified preferred items were conducted several times with each participant. To demonstrate that the tokens had reinforcing properties, a color-sorting or letter-cross-out task was conducted with and without tokens. When correct responses were followed by tokens, responses were higher than when no consequences were delivered (these data are available upon request).

Brief Treatment Comparison

Each participant was exposed to three treatment conditions presented daily in a multielement design. All sessions lasted 10 min. The physical arrangement and prompting procedures were identical to those used during the escape condition of the functional analysis. Teachers ignored all problem behavior (i.e., did not remove task materials following target behaviors) during all treatment conditions.

DNRA. The teacher reinforced task engagement on a fixed-interval (FI) 30-s schedule with a 1-s limited hold. The teacher evaluated the child's behavior at 30-s intervals. If task engagement was demonstrated when the teacher evaluated the child's behavior, the teacher delivered a 20-s break by removing the task and turning away. The task was re-presented following the 20-s break, and the DNRA schedule was again in effect. If other behaviors were occurring when the teacher evaluated the child's behavior, no consequences were delivered and the 30-s interval was reset.

DRA. Procedures were identical to those under DNRA except that a token, rather than escape, was delivered if task engagement was observed when the teacher evaluated the behavior. Tokens were exchanged following the session for access to items identified in the preference assessment. Each token was exchanged for 15-s access to preferred items. The teacher counted out the tokens, told the child how much time he or she was allowed to spend with the items, and reminded the child about the relation between the number of tokens and access time.

NCR. The teacher presented one token at a time on a fixed-time 30-s schedule. At the end of the session, participants exchanged their tokens for 5-min access to activities identified in the preference assessment.

The treatment comparison continued until there was a difference in levels of problem behavior across treatments, or until at least four sessions of each condition had been presented with no differences in problem behavior. The length of this comparison was determined prior to the evaluation and was limited by the amount of time permitted for assessment purposes. If levels of problem behavior were undifferentiated at the end of the brief treatment comparison, teacher acceptability (described below) was used to determine which treatment component to evaluate in the next phase. Treatments judged most effective or most acceptable were subsequently evaluated in a withdrawal design (see further description below). Nelly's teacher rated the most effective intervention as unacceptable and was given a choice be-

tween the intervention that was most effective and the one that was most acceptable.

Treatment Evaluation

Baseline conditions for all participants were similar to the escape conditions of the functional analyses except that all target behaviors (both problem and task engagement) were ignored. Treatment sessions evaluated in this phase were procedurally identical to those described above. Baseline and treatment conditions were alternated in a withdrawal design. Toward the end of the evaluation for Nico, the DRA schedule was increased by 15 s when the two previous data points were within 10% of the current phase mean. The schedule thinning continued until a 60-s schedule was reached. The teacher selected the terminal schedule.

Intervention Rating Profile 15 (IRP-15)

Teachers were given an IRP-15 (Martens, Witt, Elliott, & Darveaux, 1985) after the brief treatment comparison but prior to being told of, or visually inspecting, the results. The IRP-15 is a 15-item Likert-type scale that assesses general acceptability of interventions. Scores generated by the IRP-15 range from 15 to 90. Higher scores indicate better acceptance of interventions (Von Brock & Elliott, 1987). Ratings above 52.5 are typically considered to reflect acceptability by the rater. Following treatment selection and treatment evaluation, teachers were shown the results of the evaluation and again completed an IRP-15 for the treatment evaluated in their classroom.

RESULTS

Functional analysis results, presented in Figure 1, showed that levels of problem behavior were consistently higher in the escape condition than in the attention and control conditions. The results of the brief treatment comparisons also are depicted in Figure 1. For Nelly, the overall level of tantrums was slightly lower during NCR than during DNRA and DRA. For Nico, levels of problem behavior were low and undifferentiated across the treatments. For Max, levels of head shaking were lower under DRA and NCR than under DNRA. For Nico and Max, DRA was selected for the treatment evaluation because no single treatment condition was clearly superior and DRA was associated with high acceptability ratings (see below). For Nelly, NCR was selected by her teacher as the treatment to be evaluated even though she rated NCR low in acceptability. Nelly's teacher stated that she wanted to use the most effective intervention even if she did not like it as much.

The results of the treatment evaluations are shown in Figure 2. For all participants, levels of problem behavior were much lower during treatment than in baseline. Treatment remained effective even when the DRA 30-s schedule was thinned to 45 s for two sessions and then to 60 s for three sessions for Nico.

Table 1 presents the IRP-15 ratings completed by each teacher. Following the brief treatment comparison, each teacher rated DNRA and NCR below 52.5, suggesting that these treatments were unacceptable. DRA received ratings of 70 or higher, suggesting that DRA was acceptable for each teacher. Following the treatment evaluation, Nelly's teacher rated the previously unacceptable NCR intervention acceptable. For Nico and Max, teacher acceptability ratings for DRA interventions remained high.

DISCUSSION

An approach for identifying effective and practical classroom-based interventions by incorporating functional analysis, brief treatment comparisons, and assessment of teacher acceptability was demonstrated in three classrooms. Functional analysis results indi-

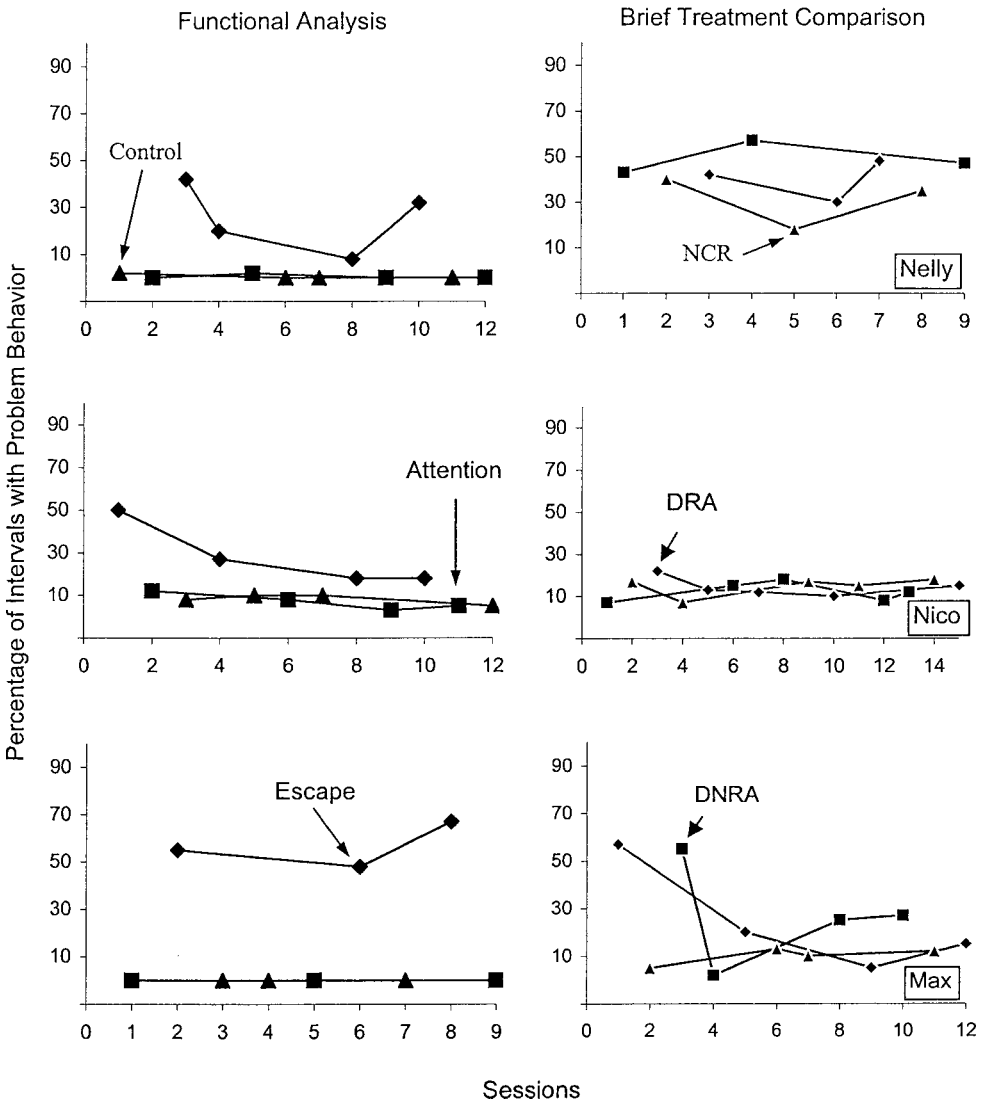

Figure 1. Functional analysis results for Nelly (top left panel), Nico (middle left panel), and Max (bottom left panel). Brief treatment comparison results for Nelly (top right panel), Nico (middle right panel), and Max (bottom right panel).

cated that the classroom problem behavior of 3 children was maintained by escape from task demands. Each child was exposed to 10-min conditions of NCR, DRA, and DNRA in a multielement design to determine which was associated with the lowest level of problem behavior. Teacher acceptability of each treatment was assessed, and acceptability and effectiveness results were used to select treatments for more extensive evaluation using brief withdrawal designs.

This approach resulted in the selection of three positive-reinforcement-based interventions to reduce behavior maintained by negative reinforcement. As demonstrated by the brief comparison, DRA and NCR worked as well or better than DNRA. As demonstrated by the teacher acceptability ratings, DRA was preferred over DNRA. In the absence of this information, a behavioral consultant may have recommended a treatment (e.g., DNRA) that was less effective (Nelly) and

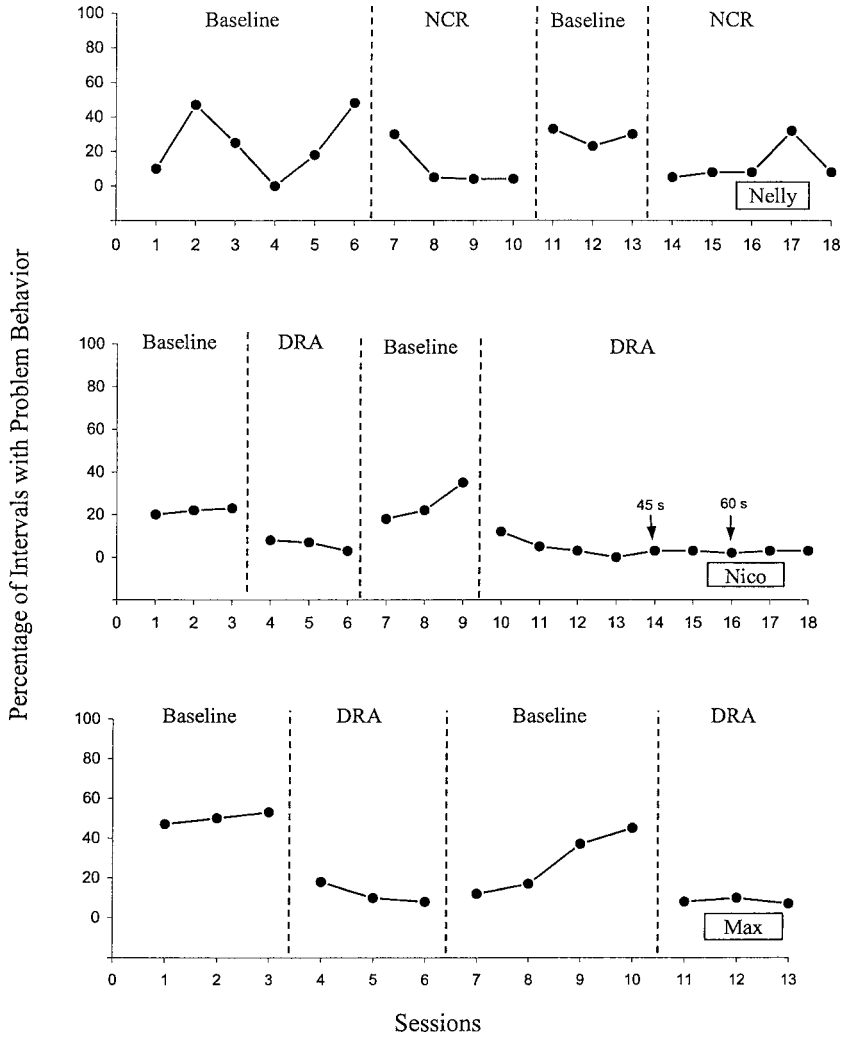

Figure 2. Treatment evaluation results for Nelly (top panel), Nico (middle panel), and Max (bottom panel).

less preferred (all teachers) than the treatments selected in the study. This possibility highlights the issues associated with translating research findings into community settings. That is, procedures proven to be effective in one setting (e.g., university laboratory, clinical treatment room) may not be acceptable to those who must implement them in applied settings.

The teacher acceptability results are of particular interest for several reasons. First, the IRP-15 ratings indicated that DRA was the only acceptable treatment to these 3 teachers after each treatment had been implemented. These results support the finding in the acceptability literature that positive reinforcement procedures are more acceptable to teachers than those involving negative reinforcement or punishment (Witt & Martens, 1983; Witt et al., 1984). However, it is noteworthy that none of the teachers rated NCR as acceptable. Second, Nelly's teacher was asked to choose an intervention because she rated NCR as unacceptable even though NCR was slightly more effective. Nelly's teacher chose NCR, stating that she wanted to use the intervention that worked the best regardless of preference. Equally important

Table 1
Teacher-Generated IRP-15 Scores for Each Treatment

Participant	Treatment	Brief treatment comparison	Treatment evaluation
Nelly	DNRA	52	
	NCR	29	58[b]
	DRA	78[a]	
Nico	DNRA	26	
	NCR	30	
	DRA	70[a]	73[a]
Max	DNRA	27	
	NCR	15	
	DRA	75[a]	74[a]

Note. Any intervention score above 52.5 is considered acceptable.
[a] An acceptable treatment.
[b] A change from an unacceptable intervention to an acceptable intervention.

is the fact that Nelly's teacher changed her rating of NCR to acceptable after conducting the treatment evaluation. These results (i.e., choosing an intervention based on effectiveness and changing a rating from unacceptable to acceptable) suggest that knowledge of effectiveness can alter teacher acceptability ratings for some treatments (Gresham & Noell, 1993).

Teacher preferences have been used to select classroom interventions in previous studies (e.g., Ervin et al., 1998). However, unlike most previous studies, treatments were based on the results of a functional analysis, and teacher preferences were considered after the teacher had implemented several potential treatment options. This strategy ensured that the interventions under consideration would be effective and that teachers would have experience with several potential interventions before selecting one for use in the classroom. When several interventions are equally effective, teachers can choose one based on personal preferences and classroom characteristics. Future research should replicate these findings in different class types and with problem behaviors maintained by different operant functions, expand the types of interventions evaluated for similar problems, and continue to research the best methods for incorporating relevant teacher variables into a method for intervention selection.

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STUDY QUESTIONS

1. What did the authors mention as factors that might influence selection of a behavioral treatment? What other factors probably influence these decisions?

2. What interventions were selected for evaluation, and why were they selected?

3. How did the authors select (a) the functional and (b) the arbitrary reinforcers to be used in the treatment evaluations?

4. Describe how each of the treatment procedures was implemented.

5. What was the basis for selecting the interventions to be evaluated on a more extended basis?

6. Summarize the results of the brief treatment comparison.

7. What common feature of the interventions may have accounted for the generally similar results obtained during the treatment comparison?

8. What is likely to be the main benefit of including teachers in decisions about treatment selection, and what types of data would show evidence of this benefit?

Questions prepared by Sarah Bloom and Pamela Neidert, University of Florida